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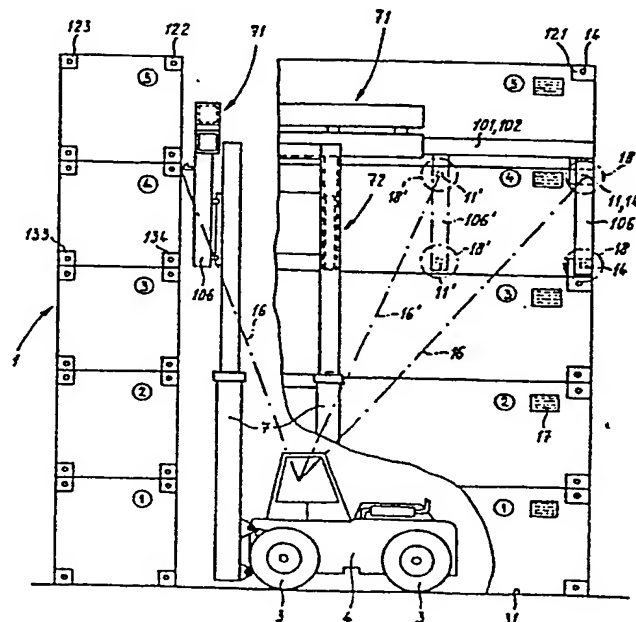
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54 Container lifting frame for fork-lift truck.

57 New lifting frame of the side frame type, for containers, fitted to a fork-lift truck which is provided with a lifting mast which can be tilted forwards and backwards from the vertical position, said frame being essentially in a vertical plane, is provided with two gripping hooks (11) placed lower than the lower side of the horizontal lifting frame structure (101, 103), and has at each end a vertical downward extending bearing arm (106) ending opposite the bottom corner pieces (134) of the container, to provide a stop against which the bottom corner pieces of a gripped container can rest.

The horizontal frame (101, 103) may extend upward, and may slope backwards or be staggered backwards, to support a second container placed on the gripped container. Greatly improved view for the driver for engaging and lowering one or two containers is provided and faster and safer handling.

fig-3



# Container lifting frame for fork-lift truck

The invention relates to a lifting frame for containers, of the side frame type, for use on a fork-lift truck which is provided with a lifting mast which can be tilted forwards and backwards from the vertical position, along which lifting mast the container lifting frame can be moved from the ground to the maximum lifting height, and where the lifting frame, lying essentially in a vertical plane, carries near each of its two ends a gripping element, such as a hook, projecting from the front face, for co-operation with the corresponding top corner piece via the opening in its longitudinal side face which is parallel to the longitudinal side face of the container, and where the vertical part of the lifting frame extends downwards so far below each gripping element that each of the two bottom corner pieces of the same longitudinal side face of the container can rest against it during the lifting, and where the lifting frame may or may not be telescopic in the horizontal direction in order to be adjustable to 20-40 foot containers and the like.

Lifting frames of this kind are known from Dutch Patent Application 7203582. Although in the said publication it is stated that the side lifting frame described is specially designed for the purpose of giving the driver sitting in the cab of the fork-lift truck a better view of the generally hook-shaped gripping elements on the front face of the lifting frame, it appears in practice that this is still causing great problems. The various horizontal supporting bars and sloping struts substantially impede this view. Another factor is that the information on the container, such as name and address of consignor and consignee, weight of the container, routing and content, are all provided on a standard place near the top righthand corner on the side of the container. It is also

difficult for the driver of the fork-lift truck to see this information because of the design of the existing lifting frames.

The use of side frames for empty container transfer has, nevertheless, great advantages, because the user can handle two  
5 or more containers stacked on top of each other at the same time. People are beginning to stack containers five high, particularly in areas where land prices are very high. This in itself is possible without any problem with a side frame on a fork-lift truck of adequate height on the basis of two over three  
10 containers. It will be clear that with higher stacking the above-mentioned problem of a poor view can only become more aggravated. Conveyance economy plays a very important role for such businesses, and the drivers of the fork-lift trucks, who are required to work fast, are particularly hampered by the poor  
15 view, so that it often happens that the projecting gripping elements come to rest beside the openings of the corner pieces and damage or can even pierce the container.

It is therefore the object of the invention to improve such a lifting frame of the side frame type in such a way that the view  
20 is considerably improved. A further aim is to facilitate the transfer of two containers stacked on top of one another and particularly to make it safer.

The lifting frame described in the preamble is according to the invention characterised in that each of the two gripping elements  
25 is placed essentially lower than the supporting horizontal part of the lifting frame and is attached to the top end of a bearing arm which extends each vertical end part of the lifting frame downwards, and against whose lower end each of the two bottom corner pieces of the container can rest. The supporting  
30 horizontal part of the lifting frame is now at least partially above the top corner pieces of the container to be gripped, and outside the lines of vision. An additional, but major advantage

is also achieved with the construction according to the invention, because the horizontal member acts as a sturdy railing for container which may eventually be placed on the gripped container.

Thanks to the downward extended bearing arms, which alone take care of the carrying and supporting of the gripped container, the actual horizontal bearing part of the lifting frame can, according to a preferred embodiment, be designed as a low, essentially closed support, as a result of which the weight and height can be reduced. In this embodiment also, the lifting frame can still act as a railing for a second container. It will be clear that the known designs for making the frame telescopic or otherwise in the horizontal direction to permit adjustment of it to 20-40 foot containers and the like can also still be used.

According to a preferred embodiment, the two bearing arms or possibly the whole lifting frame are preferably extended upwards to a height equal to the top side of a second container placed on the gripped container. Since during conveyance the lifting mast is generally tilted backwards, there is a risk that the top container could slip off the gripped container. A secure support of the top container in this situation by means of the bearing arms acting as railings, makes this process considerably safer. It will be clear that this gives better running economy.

Since, on the one hand, it is easier and thus more pleasant for the driver of the fork-lift truck to tilt the lifting mast with the whole lifting frame a little forward when picking up a container, it is advantageous to make the upward extended bearing arms slant backwards at a corresponding angle, in order to avoid pushing to the side another container placed on top of the gripped container, with all the risks this involves. Since, on the other hand, it can happen that the second container placed on top of the container to be gripped is not exactly above it, but is slightly shifted in the direction of the lifting frame, the

insertion of the hook-shaped gripping elements would not be possible without shifting of the top container, unless - according to a preferred embodiment - the said upward extended bearing arms or the horizontal part of the whole lifting frame  
5 are disposed staggered backwards.

From American Patent 3,734,324 a fork-lift truck is known in which the hooks in the extended (40 ft.) position are reasonably visible, but in the retracted position (20 ft.) they are just as difficult to see as in all other known lifting frames, owing to  
10 the presence of the slanting struts. This lifting frame also supports the bottom edge of the container near the middle, where no container is ever reinforced, so that damage can occur to the container, for example denting.

Finally, in this design also, as in all known designs, the  
15 sliding mechanism is partly above the gripped container, so that it is impossible to handle a second container on top of it at the same time.

According to another preferred embodiment, operation with the lifting frame according to the invention is improved in that a  
20 light source is provided in each bearing arm at least near the gripping element, and is directed towards the container to be conveyed and screened off for the driver of the fork-lift truck, and in that corresponding light sources may be provided near the support points at the bottom end of each bearing arm. It will be  
25 clear that the lighting thus provided is much less blinding for the driver than the usual overall lighting of the container. This applies in particular in fog and because an increasing number of containers with reflecting walls are being used, for example refrigerated containers and other containers with plastic walls.  
30 The lighting at the top side is necessary during gripping of the container with the hook; that at the bottom side is needed in particular for setting down the container on the ground or on top

of other containers. The smaller number of light sources also requires less energy.

In the description below of the figures appended as examples, a preferred embodiment of the invention will be described in  
5 greater detail.

Fig. 1 shows a five-high stack of standard containers with a fork-lift truck with side lifting frame according to the state of the art, on the left a side view, on the right a partial rear view to the righthand side of the driver.

10 Fig. 2 shows the same as Fig. 1, but with a high-positioned lifting frame with downward extended bearing arms according to the invention.

Fig. 3 shows an embodiment according to the invention corresponding to that in Fig. 2, but with the lifting frame of reduced size in the vertical direction, and in which a number of  
15 light sources are also indicated.

Fig. 4 shows a partial side view of an alternative embodiment of the bearing arms according to the invention.

Corresponding parts are given the same reference numbers in all  
20 figures. All reference numbers above 18 are made up of the indication of the main part with reference to a detail after it: the lifting frame is indicated as a whole by 10, its parts by 101, 102 etc., which should be read in words as: ten-one, ten-two etc.

25 Fig. 1 shows a number of standard containers 1, which are stacked five high, with the containers for the sake of simplicity being numbered ①, ② etc. to ⑤. They are resting in the known manner with the corner pieces on top of each other. These are largely

empty containers, since the invention relates to the lifting process using side frames, and this is permitted only with empty or practically empty containers. Reference number 2 indicates a standard fork-lift truck which can be driven and manoeuvred with  
5 very sturdy wheels 3, for example provided with solid rubber tyres, on a flat floor 31. Provided in the body 4 are all mechanical parts for driving, controlling, lifting and tilting the lifting mast, and any communication equipment. It also contains any necessary ballast. Provided on the front is a cab 5,  
10 in which the driver sits, and in the normal position his eyes are roughly at point 6. Via transparent panels in the roof, the driver should be able to have a good view of all necessary lifting and driving operations. The lifting mast 7 is hingedly attached at point 8 to the front of the fork-lift truck. By means  
15 of, for example, a hydraulic jack 9, the lifting mast can be tilted some degrees forward and several degrees backwards. The known lifting and lowering means belonging to the lifting mast 7 are not shown. The side lifting frame 10 is attached to the top end of the lifting mast and extends in the horizontal direction  
20 transversely to the lifting mast and the fork-lift truck. The lifting frame 10 can be telescopic in the horizontal direction, as schematically shown in Fig. 3, in order to be suitable for the standard 20-40 foot containers and the like. Disposed at each end of the lifting frame is a hook as a gripping element, which  
25 projects from the flat front face of the lifting frame to be able to engage with the opening 14 of the top corner piece 121 of the container 1. The opening 14 is provided in the side face of the corner piece 121 which runs parallel to the side face 15 of the container.

30 The lifting frame 10 is made up of two horizontal supports 101 and 102, which are at a distance from each other and connected to each other to form a frame through diagonal bars 104 and vertical bars 103. The two vertical end bars 105 serve as bearing arms for the container. They are located exactly opposite the corner

pieces 121 and 131 and are approximately the same length as the height of the container. As shown in the right half of Fig. 1, there is at the top end of the support bar 105 the hook 11 which is exactly opposite the opening 14 in the corner piece 121.

5 During lifting, the container rests with the corner pieces 131 against the bottom side of the bearing arm 105 of the lifting frame 10. Located near the top righthand corner piece 121 is always the plate 17 with all details of the container, such as consignor and consignee, weight, type of load etc. The

10 information plate 17 and the two top corner pieces 121 and 122 must be clearly seen by the driver from point 6 during the transfer operation with the fork-lift truck, without the driver having to make any special effort to do so. The lines of vision

15 16 in Fig. 1 are, however, in the known design obviously seriously obstructed by parts of the lifting frame, in particular by the diagonal struts 104 (see horizontal dotted line h) and the bottom horizontal bearing bar 102.

Fig. 2 shows the first solution according to the invention.

20 Attached to the lifting mechanism, which is schematically indicated by 72 and still remains unchanged in principle, is a lifting frame 10 which is positioned higher up. This lifting frame 10 corresponds essentially to the lifting frame 10 of the known state of the art, as illustrated in Fig. 1. However, the

25 bearing arms 105 are extended downwards by bearing arms 106, which are approximately equal in vertical length to the height of the container. The hook 11 is on the top end of the downward extended bearing arm 106, while the lower end of the bearing arm 106 in the operating position runs free of the container 3, but

30 provides a support face for the bottom corner pieces 131 and 134. It can be seen clearly from Fig. 2 that the lines of vision 16 extend entirely unobstructed from the driver to the hook 11 and also to the information plate 17. It will be clear that the lifting mechanism 72, which is kept relatively low, in no way

35 obstructs the view, and that the invention can be used for a



fork-lift truck with unchanged lifting mast and lifting mechanism. It can be seen clearly from the lefthand half of Fig. 2 that the lifting frame at the level of the container ⑤ provides a support for the container ⑤ which is loose on top of the gripped container ④. The fork-lift truck loaded with containers is generally driven with the lifting mast sloping backwards, so that it is impossible for the container ⑤ to slide off the container ④, because the lifting frame serves as a railing if there is unexpected slipping.

Fig. 3 shows schematically an alternative embodiment, in which the lifting frame does not extend so far in the vertical direction and is therefore lighter, albeit retaining sufficient rigidity. In this illustration the possibility is also shown schematically for shifting the downward projecting bearing arms 106 to the position for a 20-foot container 106', which is shown with dotted lines. The telescopic device is shown schematically by 71. Fig. 3 also shows schematically by circles 18 and 18', near the hooks 11, 11', a light source which, while being invisible for the driver, shines in the direction of the container and there alone lights up the necessary surface. The same applies also to the underside of the container, which is particularly important for depositing a container on the ground or on top of other containers. The line of vision is not obstructed for smaller containers 16' either.

Fig. 4 illustrates an addition which can be used both for the embodiment according to Fig. 2 and for that according to Fig. 3. The lifting frame 10 according to Fig. 2 or the more compact lifting frame 101, 102 according to Fig. 3 can be used with Fig. 4, but for the sake of simplicity it is not shown. Since, in order to make it easier to insert the hook 11 in the openings 14 of the top corner pieces of the container, a driver carries out the picking up of the container with a slightly forward sloping lifting mast 7, it is necessary to carry out the upward extended

bearing arms 107, which serve as "railings", sloping backwards through an angle  $\alpha$  of some degrees. This will mean that the top ends of the upward extended bearing arms 107 do not undesirably slide any top container (5) which may be present to the left (Fig. 4) relative to the container (4). It does, however, happen that the top container (5) is positioned shifted slightly to the right (Fig. 4) on the container (4) to be gripped. For this, it is desirable, below the level of the transition between the containers (4) and (5), to make the bearing arm 107 staggered backwards, as shown by dotted lines in Fig. 4. The bearing arms are then in the position shown by 107', and the stagger is indicated by 108'. Without illustrating this in detail, for the slanting, not staggered embodiment the position of the horizontal supports is shown as 101/102 and the position of the staggered embodiment is shown as 101'/102'. The horizontal bearing bars or the whole frame according to Fig. 2 are therefore shifted backwards over some distance, in order to obtain the staggering 108'. A staggering backwards is, however, limited, so that the whole unit can be raised and lowered freely by the lifting mast.

C L A I M S

1. Lifting frame for containers, of the side frame type, for use on a fork-lift truck which is provided with a lifting mast which can be tilted forwards and backwards from the vertical position, along which lifting mast the container lifting frame can be moved  
5 from the ground to the maximum lifting height, and where the lifting frame, lying essentially in a vertical plane, carries near each of its two ends a gripping element, such as a hook, projecting from the front face, for co-operation with the corresponding top corner piece via the  
10 opening in its longitudinal side face which is parallel to the longitudinal side face of the container, and where the vertical part of the lifting frame extends downwards so far below each gripping element that each of the two bottom corner pieces of the same longitudinal side face of the  
15 container can rest against it during the lifting, and where the lifting frame may or may not be telescopic in the horizontal direction in order to be adjustable to 20-40 foot containers and the like, characterised in that each of the two gripping elements (11) is placed essentially lower than the  
20 supporting horizontal part (101, 103) of the lifting frame (10) and is attached to the top end of a bearing arm (106) which extends each vertical end part (105) of the lifting frame downwards, and against whose lower end each of the two bottom corner pieces (134) of the container (1) can rest.
- 25 2. Lifting frame according to Claim 1, characterised in that the lifting frame (10) is made up of one or more horizontal members (101, 102) (Fig. 3) connected to each other, and forms an essentially closed support on whose ends the downward extending bearing arms (106) are provided.

3. Lifting frame according to Claim 2, characterised in that the two bearing arms (106) and/or the whole lifting frame (10) are extended upwards (107, 107') to a height equal to the top side of a container (5), which is placed on the container (4) gripped by the lifting frame (10).

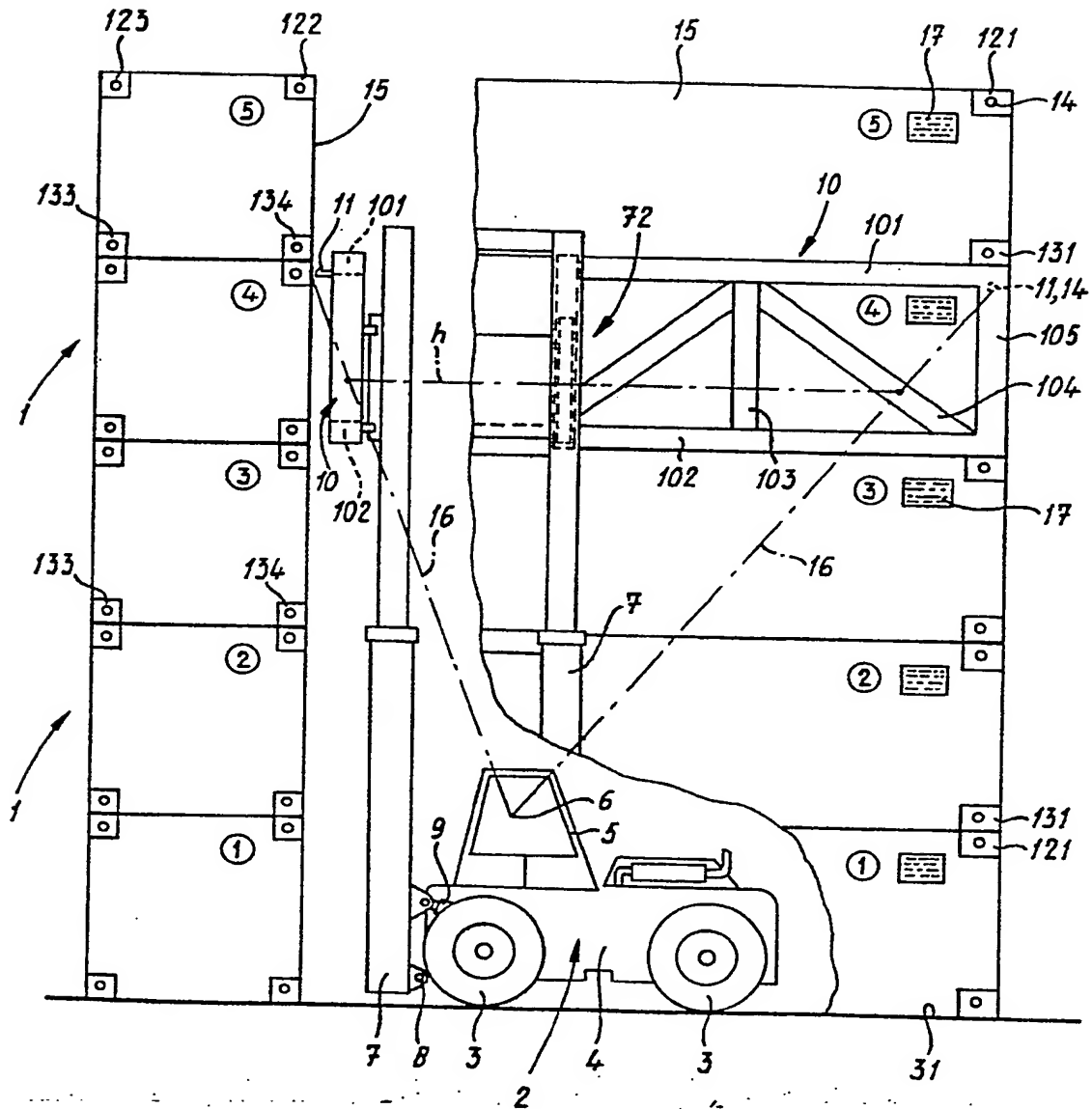
4. Lifting frame according to Claim 3, characterised in that the two upward extended bearing arms (107) and/or the whole lifting frame (101, 102) from a point level with the top end of the gripped container (4) relative to the bearing face of the downwards extended part (106) of the bearing arms:

10 a) either slope backwards through an angle ( $\alpha$ ) of some degrees. b) or are staggered backwards (107'),

15 in both cases in such a way that the ends of the two upward extended bearing arms (107, 107') run free of another container (5) placed on the gripped container (4) when the lifting mast (7) with the lifting frame (10) during the picking up of a container is tilted forwards through some degrees, in order to execute the picking up more reliably.

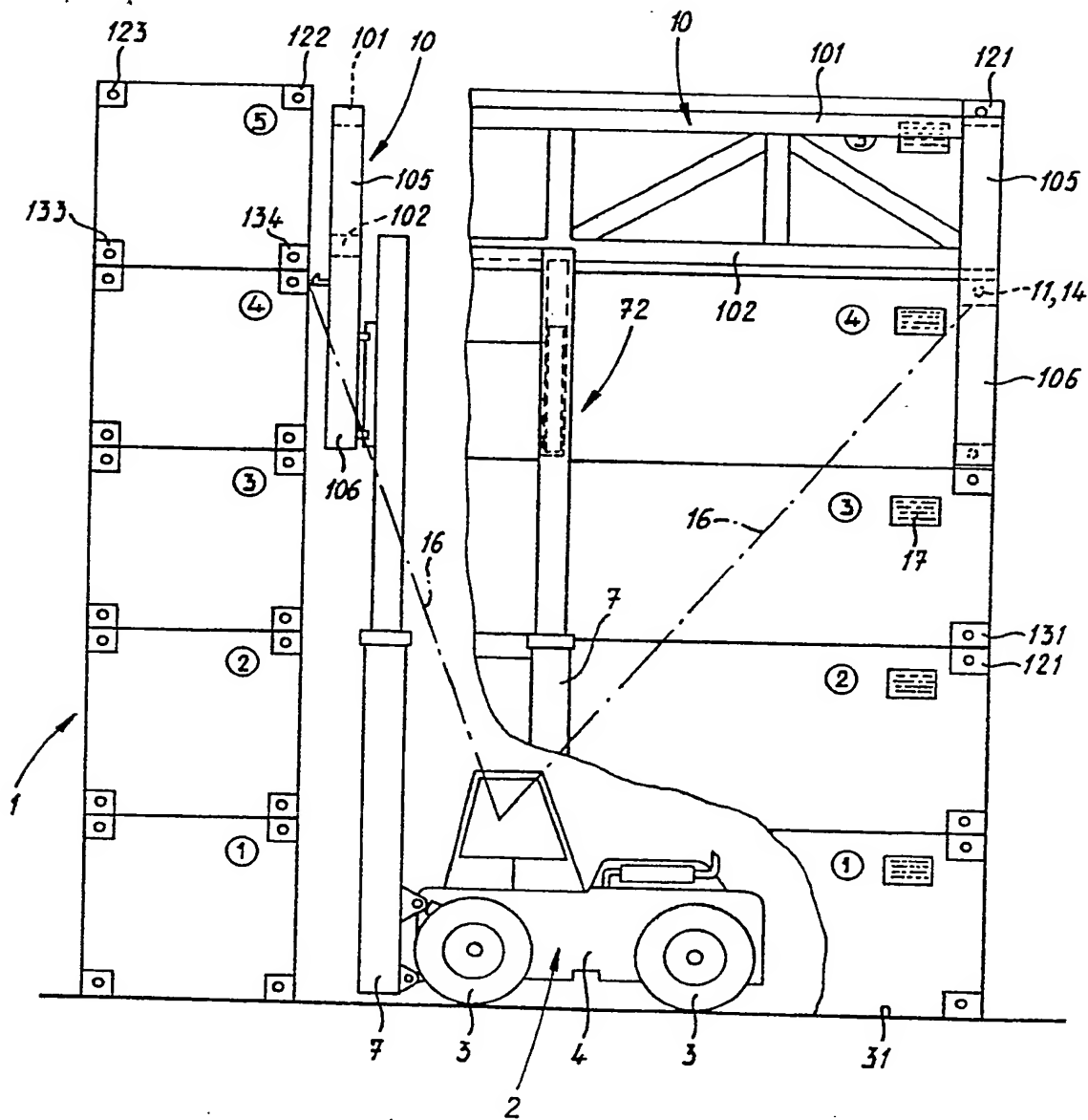
5. Lifting frame according to one or more of the preceding claims, characterised in that a light source (18, 18') is provided in each bearing arm (106) at least near the gripping element (11), and is directed towards the container to be conveyed and screened off for the driver of the fork-lift truck, and in that corresponding light sources may be provided near the support points at the bottom end of each bearing arm.

fig-1



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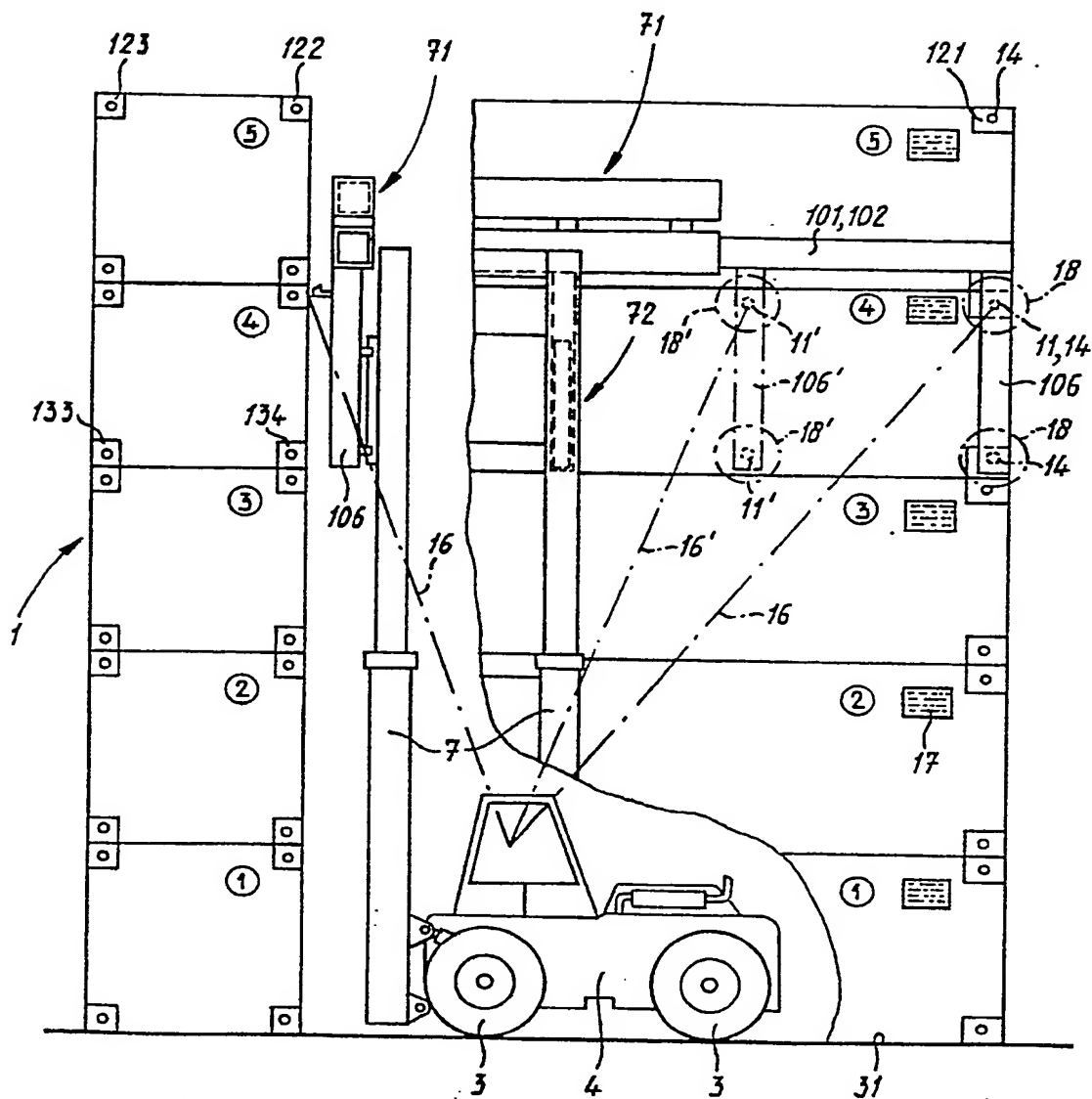
fig - 2



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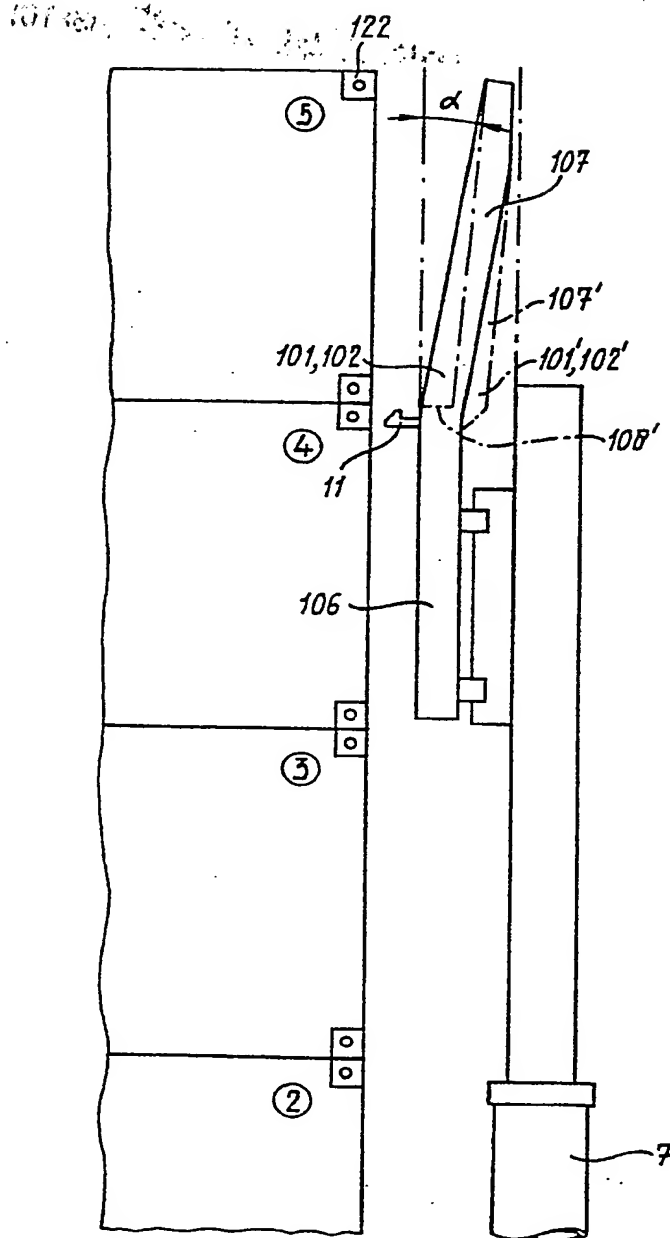


fig-3



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fig - 4



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DOCUMENTS CONSIDERED TO BE RELEVANT													
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int Cl 4)										
A, D	US-A-3 734 324 (LYNCH) * Whole document *	1	B 66 F 9/18										
A	US-A-3 752 346 (THOMPSON).												
A	US-A-4 449 882 (PEROTT)												
A	DE-A-2 908 822 (DREHTAINER CONTAINER-TECHNIK)												
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (Int Cl 4)										
			B 66 F										
Place of search THE HAGUE		Date of completion of the search 07-02-1986	Examiner VAN DEN BERGHE E. J. J										
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